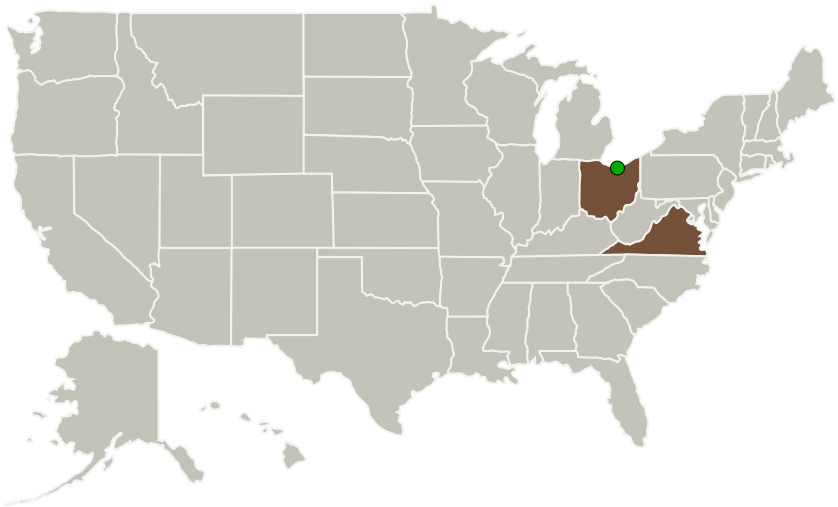
Adaptive and Cognitive Modem for SmallSat Lasercom at High Data Rates, Phase I

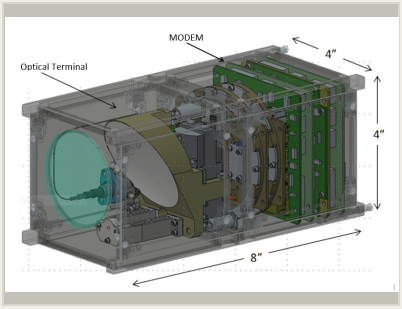
Completed Technology Project (2017 - 2017)

Project Introduction

In this NASA SBIR program, Fibertek, Inc., working with its team partner, proposes to design, develop and demonstrate a SmallSat/CubeSat form-factor, optical communication modem suited for space optical communication links from LEO/MEO orbits. The modem will be suitable for use in both space-to-ground and inter-satellite links. Unlike fiber-optic telecommunication modems, this modem is specifically adapted to the highly dynamic nature of space optical links. Moreover, a software-defined approach leads to an adaptive and cognitive optical modem, that optimizes link BER (bit-error-rate) performance, compared to a fixed-point design of large-SWaP space optical modems used in recent and planned space optical communication demonstrator missions. Protocols originally developed for RF/wireless fading channels have been be optimized and extended to terrestrial free-space-optical (FSO) modems, that have high scintillation and fading. The objective of this program is to further optimize and validate such algorithms and protocols for space optical links. Fibertek's focus will be on small-form-factor hardware implementation of such adaptive and cognitive FSO modem, compatible with a space-qualified roadmap, which can be integrated with ongoing CubeSat and SmallSat optical communication payload for demonstrator missions with Fibertek's end customers.

Primary U.S. Work Locations and Key Partners





Adaptive and Cognitive Modem for SmallSat Lasercom at High Data Rates, Phase I Briefing Chart Image

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Organizations Performing Work	Role	Type	Location
Fibertek, Inc.	Lead Organization	Industry	Herndon, Virginia
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Virginia

Project Transitions

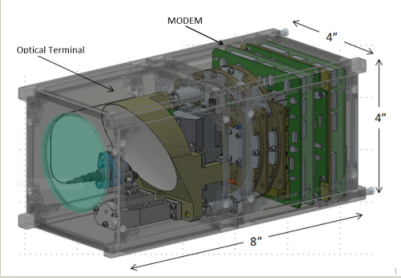
June 2017: Project Start

December 2017: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140824)*

Images



Briefing Chart Image
Adaptive and Cognitive Modem for SmallSat Lasercom at High Data Rates, Phase I Briefing Chart Image *(https://techport.nasa.gov/image/134884)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Fibertek, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

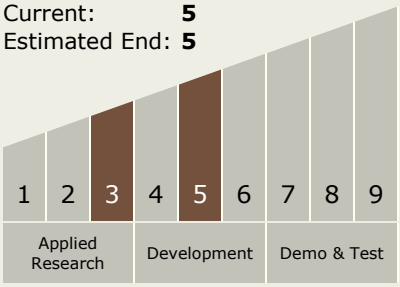
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Jain-yih Hwang

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.5 Revolutionary Communications Technologies
    - TX05.5.1 Cognitive Networking

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System